UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE
United States Patent and Trademark Office
Address: COMMISSIONER FOR PATENTS
P.O. Box 1450
Alexandria, Virginia 22313-1450
www.uspto.gov

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
09/480,193	01/10/2000	Shi-Jun Yang	IR 3556	4031

7590 04/01/2004

Gilbert W Rudman Esq
Elf Atochem North America Inc
Patent Department-26th Floor
2000 Market Street
Philadelphia, PA 19103-3222

EXAMINER	
UHLIR, NIKOLAS J	

ART UNIT	PAPER NUMBER
1773	

DATE MAILED: 04/01/2004

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No.	Applicant(s)	
	09/480,193	YANG ET AL.	
	Examiner	Art Unit	
	Nikolas J. Uhlir	1773	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *25 February 2004*.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1, 3-6, 10-11, and 14-17* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1, 3-6, 10-11, and 14-17* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08) Paper No(s)/Mail Date _____.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .
5) ☐ Notice of Informal Patent Application (PTO-152)
6) ☐ Other: _____.

DETAILED ACTION

1. This office action is in response to the amendment/request for continued examination dated 2/25/2004. Currently, claims 1, 3-6, and 10-17 are pending.

Claim Rejections - 35 USC § 103

2. The text of those sections of Title 35, U.S. Code not included in this action can be found in a prior Office action.

3. Claims 1, 3-6, and 10-11, 14-17 are rejected under 35 U.S.C. 103(a) as being unpatentable over Hennig et al. (US4876311) in view of Carson et al. (US5321056).

4. The limitations of claim 16 require a resin comprised of 60-85% by weight of a matrix comprised of polymethyl methacrylate; 15-40% by weight of highly crosslinked spherical polymeric particles that are comprised of 15-35% by weight styrene, 65-85% methyl methacrylate and 0.1-1.5% by weight allyl methacrylate, wherein the polymeric particles have a mean particle size between 25-55μm, and a particle size distribution between 15-100μm, wherein if the resin is extruded into a .125in thick sheet, the sheet has a haze number ≥90%, an opacity ≥10%, a minimum surface roughness in the range of 0.5-30μm, and a total white light transmission >78.9%.

5. With respect to these limitations, Hennig et al. (hereafter Hennig), teaches a resin composition that comprises a polymer matrix that contains crosslinked polymeric beads (column 2, lines 58-60). The polymer matrix can be one of several different resins, with acrylic resins including methyl methacrylate being preferred (column 6, lines 4-8). It is noted that Hennig teaches a specific example utilizing polymethyl methacrylate (PMMA) as the matrix resin (column 7, lines 8-20).

6. Therefore it would have been obvious to one of ordinary skill in the art at the time the invention was made to utilize PMMA as the matrix resin in the invention of Hennig, as PMMA is recognized by Hennig as equivalent to the other resins listed as suitable for forming the matrix.

7. The applicant is respectfully reminded that substitution of equivalents requires no express motivation as long as the prior art recognizes the equivalency. *In Re Fount* 213 USPQ 532 (CCPA 1982); *In Re Siebentritt* 152 USPQ 618 (CCPA 1967); *Grover Tank & Mfg. Co. Inc V. Linde Air Products Co.* 85 USPQ 328 (USSC 1950).

8. Regarding the polymeric beads incorporated into the resin, Hennig teaches a specific example wherein polymeric beads suitable for use in the invention are formed by a copolymer of methyl methacrylate and styrene, wherein the copolymer is in the form of beads (equivalent to spherical) having a median particle size of 37 microns (columns 6-7 example 1). 1% of a crosslinking agent is utilized (columns 6-7, example 1). The examiner acknowledges that this particular example in Hennig utilizes glycol methacrylate as opposed to the allyl methacrylate crosslinking agent required by claim 16. However, Hennig teaches that suitable crosslinking agents for the particles include vinyl, allyl, and crotyl esters of acrylic or methacrylic acid, as well as other crosslinking agents such as glycol methacrylate (column 4, lines 11-34).

9. Therefore it would have been obvious to one of ordinary skill in the art at the time the invention was made to utilize allyl methacrylate as opposed to glycol methacrylate as the crosslinking agent in Hennig as these materials are recognized as equivalent for use as a crosslinking agent.

10. Regarding the composition of the polymeric beads (a bead is equivalent to being substantially spherical) incorporated into the resin, Hennig teaches that the particles are specifically chosen so as to have a refractive index that is different from the polymeric matrix by at least 0.01, preferably 0.02, more preferably 0.04 (see column 5, lines 64-69). As shown by Carson (see column 3, line 65-column 4, line 5) the relative amounts of each monomer in a copolymer determines the overall refractive index of the copolymer. Thus, it is clear that the composition of the polymeric particles of Hennig will impact the refractive index of the particles. Thus, the composition of the copolymer particles of Hennig is a results effective variable.

11. Therefore it would have been obvious to one of ordinary skill in the art at the time the invention was made to control the relative amounts of the Styrene and methyl methacrylate (MMA) monomers utilized to form the particles of Hennig so as to obtain particles having a refractive index that differs from polymethyl methacrylate (PMMA) by 0.02 or higher.

12. One would have been motivated to make this modification in view of the teaching in Carson that the composition of copolymer particles impacts their refractive index and the teaching in Hennig that particles having a refractive index that is different from the refractive index of the PMMA matrix by a factor of 0.02 or higher are desirable.

13. Given that the refractive index of copolymer particles is clearly determined by the relative concentrations of the monomers making up the copolymer particle, when 1 wt% crosslinking agent is utilized and the refractive index of the styrene/MMA is controlled such that it is different from PMMA by a factor of 0.02 or slightly higher than 0.02, the

composition of the particles required by the applicant in claim 16 will be met. This is logical given the teachings in the Carson reference that the composition of a copolymer determines its refractive index and give the fact that the instant specification states that the "The frosted appearance of the thermoplastic compositions is achieved through the mismatch of the refractive indexes, $\Delta n>0.02$ (Specification page 3, lines 26-31). Further, the applicant's own arguments are consistent with the teachings in the prior art, namely that the refractive index of a copolymer will be the mathematical average based on the amount of each monomer and that "only at these lower levels of styrene will the refractive index difference between the beads and the matrix be such that a frosted appearance is achieved (see arguments, page 6, second paragraph). Thus, the compositional limitations of claim 1 are met when the refractive index of the particles of Hennig is controlled to be different by a factor of 0.02 or slightly higher than 0.02 from the methyl methacrylate matrix.

14. Regarding applicants requirements in claim 16 regarding the specific haze, opacity, roughness, and light transmission properties of the resin if the resin is extruded into a 0.125in thick sheet. The examiner takes the position that these limitations are met by the composition of Hennig et al. set forth above, wherein 70% PMMA and 30% polymeric particles are mixed and the polymeric particles are formed from a styrene/MMA copolymer having a refractive index different from the PMMA matrix by a factor of 0.02 or slightly higher than 0.02. This composition comprises the same matrix polymer (PMMA) as that utilized by the applicant in the specification and required by the instant claim 16. The composition further comprises polymeric particles that meet all of

the applicant's claimed compositional requirements for the reasons set forth above at section 13. .

15. Regarding the roughness requirement so claim 16, It is of particular note that the applicant in the instant specification states that the "The surface texture is controlled by the degree of crosslinking and mean size of the fine particles" (Specification page 3, lines 26-31). Bearing this in mind, it is noted that the amount of crosslinking agent utilized by Hennig is completely encompassed by range specified by the applicant in claim 16. Thus, in light of the fact that the same monomers are utilized to form the particles, as well as the same amount type of crosslinking agent is used by Hennig, it is logical to believe the particles are crosslinked to the same degree as that of the applicant. As the applicant specifically states that surface texture (i.e. roughness) is controlled by the degree of crosslinking of the particles, it is logical to believe that when the resin composition of Hennig is extruded to a thickness of 0.125μ, the applicants claimed roughness limitations will be met.

16. Last, while the examiner acknowledges that Hennig teaches that the invention is directed towards the formation of "opaque" resins, it is noted that Hennig teaches an example wherein a composition according to his invention is extrude to a thickness of 3.2 mm (~.125 in) and has a light transmission of 87-89%. Thus, it appears that "opaque" as utilized by Hennig does not refer to the amount of light transmission through an extruded resin film of his composition. It is further noted that Hennig teaches a specific example wherein the resin is extruded at a material temperature of 245^{0}C, which is close to the same temperature utilized by the applicant as described on page

20 of the instant specification. Thus, in light of these similarities, the examiner takes the position that the haze, opacity, light transmission and roughness limitations of claim 16 will be met by the composition of Hennig, particularly when a resin composition comprising 70% PMMA and 30% particles is utilized and the particles are those discussed above.

17. The examiner believes the above recitation reads on the limitations of claims 1, 3-6, 10, 14 and 17, as claim 16 includes all of the limitations of these claims. Regarding claim 11, wherein the applicant requires the crosslinking agent to be divinyl benzene. Hennig specifically teaches that divinyl benzene is a suitable crosslinking agent (column 4, lines 11-27).

18. Therefore it would have been obvious to one of ordinary skill in the art at the time the invention was made to utilize divinyl benzene as the crosslinking agent in Hennig, as divinyl benzene is recognized by Hennig as equivalent to the other crosslinking agents listed as suitable.

19. Claim 15 is rejected under 35 U.S.C. 103(a) as being unpatentable over Hennig et al. in view of Carson as stated above for claim 1, further evidenced by Minghetti (US6077575).

20. Hennig et al. does not teach the incorporation of a colorant within the polymeric particles, as required by claim 15.

21. Though Hennig et al. does not disclose that a colorant may be added to the polymeric particle composition, the examiner takes the position that this is merely a design choice. It has been shown that the addition of a colorant to particles formed in a

similar manner and of a similar composition to those described by Hennig et al. is known, as evidenced by Minghetti, column 5, lines 35-36. Further, it is well known to add a colorant to any material in order to improve its aesthetic appeal.

22. Therefore it would have been obvious to one with skill in the art at the time the invention was made to incorporate a colorant into the polymeric particles described by Hennig et al.

23. One would have been motivated to make this modification because of the improved aesthetic appeal of the resulting article one would expect to gain as a result.

Response to Arguments

24. Applicant's arguments filed 2/25/2004 have been fully considered but they are not persuasive. In the instant case the applicant has primarily argued that the composition of the particles required by the amended claims is not taught by the cited prior art. The examiner respectfully disagrees. While the examiner acknowledges that Hennig does not expressly teach the composition of the particles required by the instant claims, Hennig does teach the use of Styrene/MMA copolymer particles that differ in refractive index from a PMMA matrix by a factor of 0.2 or more. The prior art, applicant's specification, and applicant's own arguments strongly support that the refractive index of a copolymer resin is dependant on the relative amounts of each monomer in the resin. Hennig utilizes the same two monomers (methyl methacrylate and Styrene) as that of the instant invention, and clearly teaches that the refractive index of these particles should be 0.02 or more than that of a polymethyl methacrylate matrix (which is the same matrix utilized in the instant application). Given the clear teaching in the prior art

that the refractive index of a copolymer is composition dependant, if the refractive index of a styrene/MMA copolymer has the same refractive index as that required by the instant application, it must also have the same composition. Thus, applicant's argument that the prior art does not teach the required composition is unpersuasive. Not only does the prior art teach an example that is likely to meet the claimed composition outright (a styrene/MMA particle having a refractive index that is higher than PMMA by 0.02), the prior art also provides a solid teaching of how to adjust the refractive index of a copolymer to a desired goal. Accordingly, this argument is unpersuasive.

25. Applicants remaining arguments with respect to the properties of the instant application and those of the prior art are also unpersuasive for the same reasons set forth above.

Conclusion

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Nikolas J. Uhlir whose telephone number is 571-272-1517. The examiner can normally be reached on Mon-Fri 7:30 am - 5 pm.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Paul J. Thibodeau can be reached on 571-272-1516. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

nju

Paul Thibodeau
Supervisory Patent Examiner
Technology Center 1700